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AIP

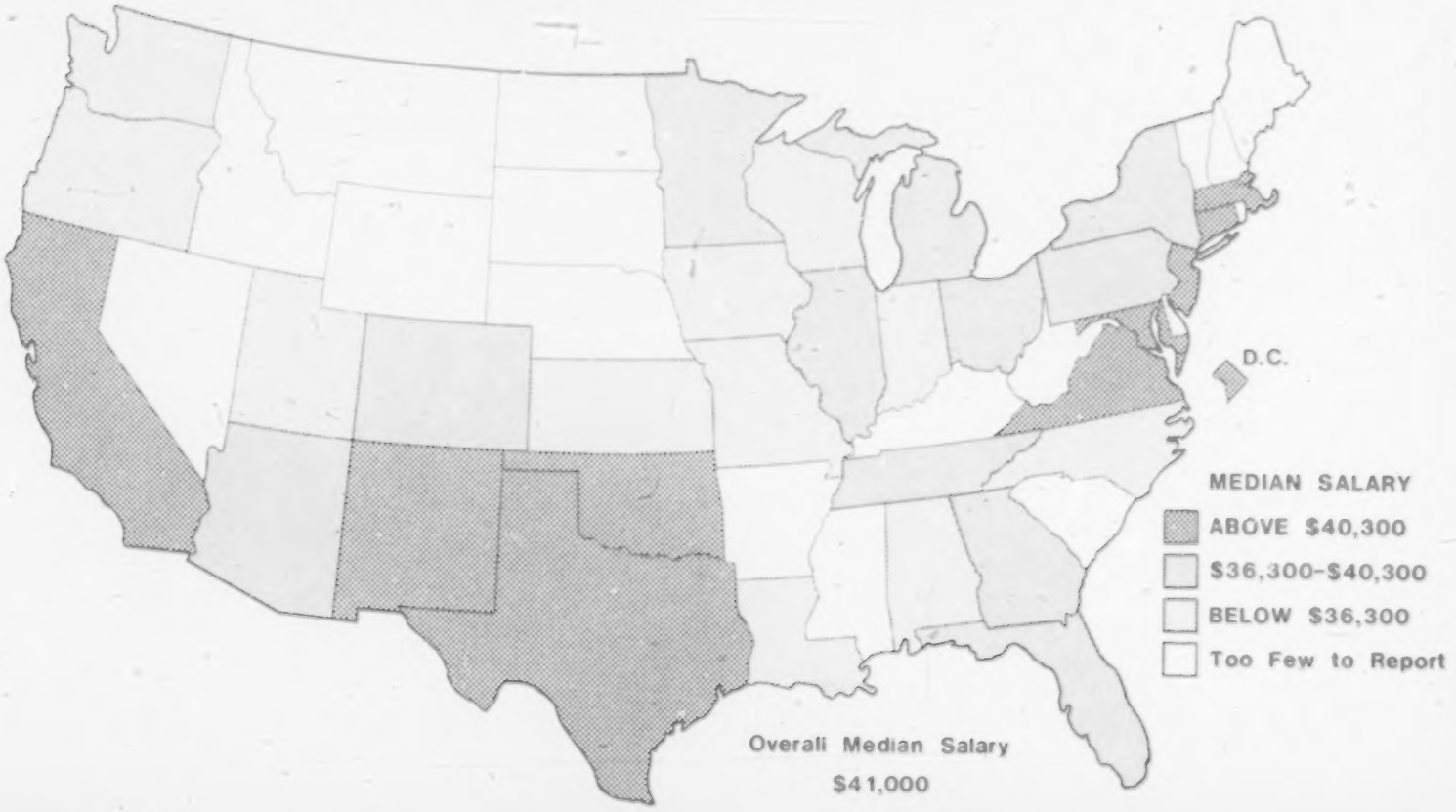
report

MANPOWER STATISTICS DIVISION

American Institute of Physics, 335 East 45 Street, New York, N.Y. 10017 (212) 661-9404

1983 SALARIES

SOCIETY MEMBERSHIP SURVEY



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1983 SALARIES

SOCIETY MEMBERSHIP SURVEY

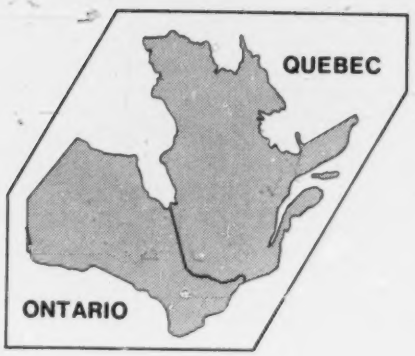
W. Keith Skelton, Beverly Fearn Porter, Roman Czujko, and Robert Cox

The American Physical Society
Optical Society of America
Acoustical Society of America
The Society of Rheology
American Association of Physics Teachers
American Crystallographic Association
American Astronomical Society
American Association of Physicists in Medicine
American Vacuum Society

COVER

This figure iilustrates variation in median salaries by state of residence. California and several states in the sunbelt and along the eastern coast maintain the greatest concentration of society members and the highest PhD salaries in the nation. Heavy representation of industry, government, and national laboratories within these states, and the higher salaries associated with such employment, account for the salary distribution found within these areas. States where relatively low salaries are observed (the Plains and Southeastern states) generally have relatively few society members, most of whom are academically employed. Where shading is absent, there are too few society members to report reliable median salaries.

Median salaries for PhD society members resident in the Canadian provinces of Quebec and Ontario were converted into U.S. dollars and are presented in the accompanying figure. These salaries are somewhat lower than the overall median salary observed in the U.S., partly reflecting the heavier academic composition of Canadian members.



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INTRODUCTION

By 1983 the median salary of society members had risen to $40,000. This was 8% higher than the $37,000 observed in 1982 and comfortably above the rate of inflation in effect during this period.[1] There was, however, considerable variation both in salary levels and patterns of increase by geographic location, employer, type of work, position, degree level, years from degree, and sex. The graphics and brief summary text in the current report highlight the major patterns of variation and change in the salaries of society members observed in 1983. Detailed tables provide extensive supporting data.

This report is the second in a new series devoted to the salaries of members of AIP Member Societies. The data presented here are based on a stratified random sample survey of over one-sixth of the U.S. and Canadian members conducted in the spring of 1983. Individuals whose memberships were current as of 12/82 were included. The overall response rate for the 1983 survey was 69%.

Most of the following discussion centers on median and quantile salaries, which are the preferred descriptive measures of central tendency and variation in typically skewed salary distributions. The tables, however, also present for comparison the salary means and standard deviations along with the median ages of each group being examined. See Appendix B for definitions and technical notes on the measures used in this report.

In addition to descriptive material outlining the salary structure of society members in 1983, we have also presented some material on salary change between 1982 and 1983. Such change can be analyzed in several ways. The most typical comparisons are cross-sectional, e.g., comparing the 1983 median salary of industrially employed PhDs to the median salary of similarly employed individuals in 1982. From the point of view of an employer, such comparisons reflect the "going rate" for such personnel and how this has changed from the previous year. Companies, universities, and national laboratories frequently seek such information in their desire to remain competitive in a changing labor market.

Cross-sectional analyses, as valuable as they are, reflect net changes; they do not examine the dynamics of salary change. For individual society members or employers seeking data on typical salary increases, they may be misleading. Longitudinal data, which look at the same people at two or more points in time, provide a better picture of these actual increases. In this report, we have presented or commented on both types of salary change where possible.

Although we have not adjusted salaries for inflation to reflect real purchasing power, it should be noted that the rate of inflation between March 1982 and March 1983 was 3.6%. The previous year it had been 6.8%, producing a cumulative inflation rate for the period between March 1981 and March 1983 of 10.7%. The latter period is the one most frequently used when salary increases, based on the longitudinal sample, are discussed. Cost of living, which also affects purchasing power, varies in different sections of the country. Some attention has been paid to such variation in our discussion of salaries in major metropolitan areas.

One will note that most of the discussion in the following pages focuses on PhDs, who form three-quarters of the full-time employed society membership. Many of the lower degree holders among the society membership are advanced graduate students who are not included in traditional salary analyses. The remaining degree holders among the membership are an atypical group representing only a small proportion of the total masters and bachelors produced in physics and physics-related fields over the years. Many of them are teachers, engineers, skilled technicians, and administrators with special interests in specific society programs. While the small size of these groups limits analysis, some discussion can be found in the section dealing with employer type.

[1]Between March 1982 and March 1983 the rate of inflation as quoted by the Bureau of Labor Statistics CPI Division was 3.6%

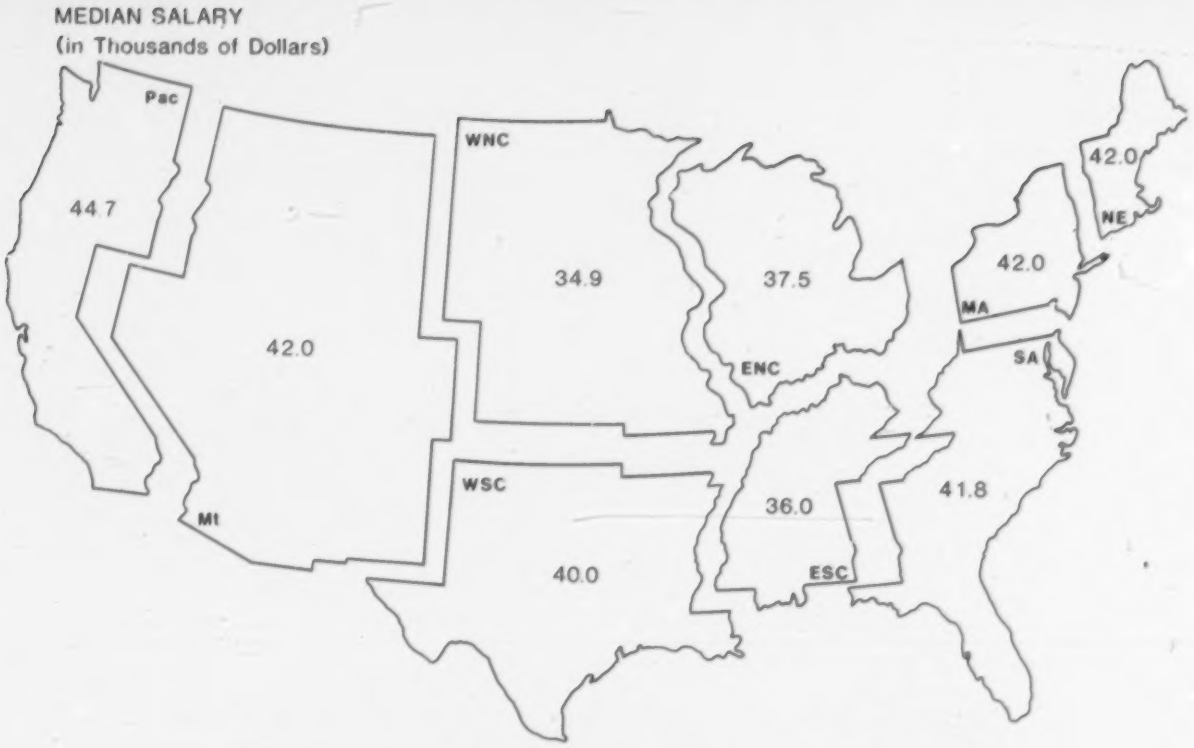

Figure 1. Variation in median salary for PhDs by geographic division, 1983.

SALARIES AND GEOGRAPHIC LOCATION FOR PhDs

• Variations in salaries by geographic division can be attributed to three major factors: age structure, employer-type composition, and salary structure for each employer type.

• The west coast has the largest proportion of industrially employed PhDs in the country (41%). This, coupled with one of the nation's highest median salaries in industry ($50,000), places the Pacific Division at the top of divisional median salaries.

• The West North Central Division has the highest proportion of academically employed PhDs in the nation (72%). These members also have the second lowest academic salary observed for all geographic divisions. The result is a suppression of the overall median salary ($6,000 under the national median).

• The influence of employer-type composition within any regional subdivision on average salaries cannot be over-emphasized. In order to examine the the effects of geographic location on salaries, independent of variations in employer type, divisional mean salaries were statistically weighted to control for those dissimilarities.

Table 1. 1983 salaries by geographic division, PhDs. (a)

	Median Salary	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)				
New England	42.0	42.7	16.2	43	312
Middle Atlantic	42.0	43.3	16.2	42	714
South Atlantic	41.8	42.9	13.6	44	604
East North Central	37.5	38.9	14.4	43	487
East South Central	36.0	36.5	10.1	44	130
West North Central	34.9	35.1	11.8	42	155
West South Central	40.0	40.3	14.3	43	211
Mountain	42.0	43.6	15.2	43	300
Pacific	44.7	45.7	14.4	43	709
Canada (b)	37.9	37.8	12.1	43	152

(a) see Appendix A for state composition of each division.
(b) Canadian salaries are reported in U.S. dollars. One dollar U.S. = 1.223 dollars Canadian.

Table 2. 1983 reported salaries, adjusted salaries and employer type distribution by geographic division, PhDs. (a)

	Academic			Industry			Government			FFRDC			Overall	
	Median Salary	Median Age	%	Median Salary	Median Age	%	Median Salary	Median Age	%	Median Salary	Median Age	%	Mean Salary	Adjusted Mean Salary
New England	35.0	44	52	46.5	41	31	44.0	44	9	*	*	4	42.7	43.2
Middle Atlantic	34.0	44	46	50.0	40	40	44.5	43	3	40.3	42	6	43.3	42.0
South Atlantic	34.0	45	41	46.0	40	14	48.8	45	3	*	*	2	42.9	41.7
East North Central	32.3	45	62	42.3	40	20	*	*	3	43.3	43	12	38.9	40.1
East South Central	29.0	45	49	*	*	6	*	*	5	43.0	42	38	36.5	36.7
West North Central	30.6	43	72	44.1	37	22	*	*	1	*	*	2	35.1	36.9
West South Central	34.1	44	59	43.6	40	36	*	*	2	*	*	-	40.3	40.0
Mountain	32.0	44	35	45.0	40	17	48.8	42	7	48.0	42	39	43.6	41.9
Pacific	36.0	46	36	50.0	41	41	38.5	41	4	47.9	42	15	45.7	43.6
Overall	33.4	44	47	47.7	40	28	45.4	44	10	45.5	42	11	42.3	42.3

(a) Mean salaries for each division were statistically weighted to reflect an employer type composition identical to that observed nationwide.

* Number of respondents was too small to calculate reliable medians.

• Standardizing the employer-type composition decreases the disparity observed between the highest and lowest geographic divisional mean salaries by $3,600. In addition it establishes four distinct groups based on the level of their weighted mean salary: (1) Pacific, New England (2) Middle Atlantic, South Atlantic, Mountain (3) East North Central, West South Central (4) East South Central, West North Central.

Table 3. 1981 and 1983 salaries by geographic division, PhDs.

	Salary Year	Median Salary	Mean Salary	Standard Deviation	Median Age	Total Number Known
		(in thousands of dollars)				
New England	1981	37.0	37.0	11.4		
	1983	43.0	43.5	12.9	44	214
Middle Atlantic	1981	37.6	39.6	14.8		
	1983	44.5	45.6	15.6	45	475
South Atlantic	1981	37.0	37.8	10.4		
	1983	43.0	44.2	12.8	45	446
East North Central	1981	34.6	36.0	11.8		
	1983	40.0	41.1	13.1	46	330
East South Central	1981	32.4	32.8	8.0		
	1983	37.8	37.3	9.4	45	97
West North Central	1981	31.0	31.1	9.9		
	1983	35.3	35.9	10.9	43	108
West South Central	1981	34.0	35.0	13.5		
	1983	40.4	41.9	13.1	44	144
Mountain	1981	36.0	37.4	11.2		
	1983	42.7	44.5	13.2	43	204
Pacific	1981	38.9	39.8	12.8		
	1983	46.0	47.0	13.1	45	499

• The East South Central and West North Central Divisions maintain the lowest weighted mean salaries in the nation. While both divisions have very low academic salaries for society members, the East South Central also has one of the lowest average salaries for national labs. This has a great impact on the Division's overall average, since 38% of the society members employed there work in the national labs.

• New England and the Pacific Divisions have the highest-paid academically employed society members in the country. In addition they are the only divisions to have weighted means substantially higher than the national average.

• During the two-year span between March 1981 and March 1983 salaries for PhDs who remained within one regional division, increased between 14 and 19%, considerably above the 10.7% inflation rate observed for that period. The largest increases were generally recorded in those divisions with the highest population growth rates, e.g., West South Central. These large increases appear to reflect the ever-increasing number of "high-tech" industrial start-ups and corporate relocations to the Sun Belt. Note, however, should be made of special regional characteristics.

Table 4. 1983 salaries and employer type distribution for selected states and Canadian provinces, PhDs. (a)

	Median Salary (in thousands of dollars)	Mean Salary	Standard Deviation	Median Age	Total Number Known	Academic %	Industry %	Gov't %	FFR&DC %	Other %
Alabama	34.9	34.4	10.1	45	20	76	-	19	-	5
Arizona	37.2	39.1	14.9	43	43	63	21	7	4	5
California	45.3	46.4	13.9	43	638	32	43	4	17	4
Northern (b)	46.0	46.9	14.4	42	310	29	40	4	24	2
Southern	44.7	45.9	13.5	43	328	34	45	5	10	6
Colorado	39.6	42.9	17.6	44	85	44	30	14	10	2
Connecticut	41.1	42.0	16.8	42	62	49	39	9	-	3
D.C.	50.0	48.7	12.7	45	120	8	3	83	-	6
Florida	39.6	38.2	12.5	45	43	79	4	11	-	6
Georgia	37.4	39.4	14.1	43	42	83	14	2	-	1
Illinois	38.4	40.0	15.0	43	189	53	15	1	27	4
Indiana	32.0	35.8	14.5	45	49	83	12	4	-	1
Iowa	34.6	34.3	9.8	43	28	83	3	3	11	-
Kansas	30.9	31.6	8.7	42	22	91	9	-	-	-
Louisiana	31.0	32.7	11.1	45	32	89	3	5	-	3
Maryland	43.0	43.7	12.7	42	175	30	21	42	3	4
Massachusetts	42.0	43.0	13.5	43	222	50	32	10	5	3
Michigan	39.0	40.1	13.4	45	85	63	30	2	1	4
Minnesota	40.0	39.1	14.6	40	48	47	47	-	-	6
Missouri	36.0	35.3	11.6	42	36	68	27	-	-	5
New Jersey	46.5	48.6	15.6	40	208	22	69	3	5	1
New Mexico	46.0	48.0	12.9	43	132	9	7	5	78	1
New York	40.0	41.7	16.7	44	354	53	29	2	10	6
Northern (c)	39.0	40.9	16.8	44	172	61	33	2	2	2
Southern	41.0	42.4	16.7	43	182	45	27	2	17	9
North Carolina	34.0	34.9	11.7	43	52	85	6	5	-	4
Ohio	38.3	39.3	13.2	45	110	54	28	8	3	7
Oklahoma	42.0	40.9	14.7	43	20	65	33	-	-	2
Oregon	32.5	39.6	20.0	49	21	76	24	-	-	-
Pennsylvania	39.8	39.8	13.6	43	152	63	28	5	-	4
Tennessee	37.4	37.7	10.4	42	91	35	9	2	53	1
Texas	41.0	42.4	14.4	42	151	49	45	2	-	4
Utah	35.8	36.6	13.4	43	20	84	16	-	-	-
Virginia	44.0	44.8	14.4	45	124	35	18	38	5	4
Washington	36.0	39.7	16.1	45	40	60	27	3	8	2
Wisconsin	32.5	35.2	15.5	41	53	78	15	2	2	3
Ontario	38.4	38.5	12.4	44	76	61	12	26	-	1
Quebec	38.4	35.8	12.1	41	25	77	19	-	4	-

(a) Several states were not included above because the number of respondents was too small to calculate reliable statistics.
(b) North of San Luis Obisbo, Madera and Mono counties.
(c) North of Orange and Putnam counties.

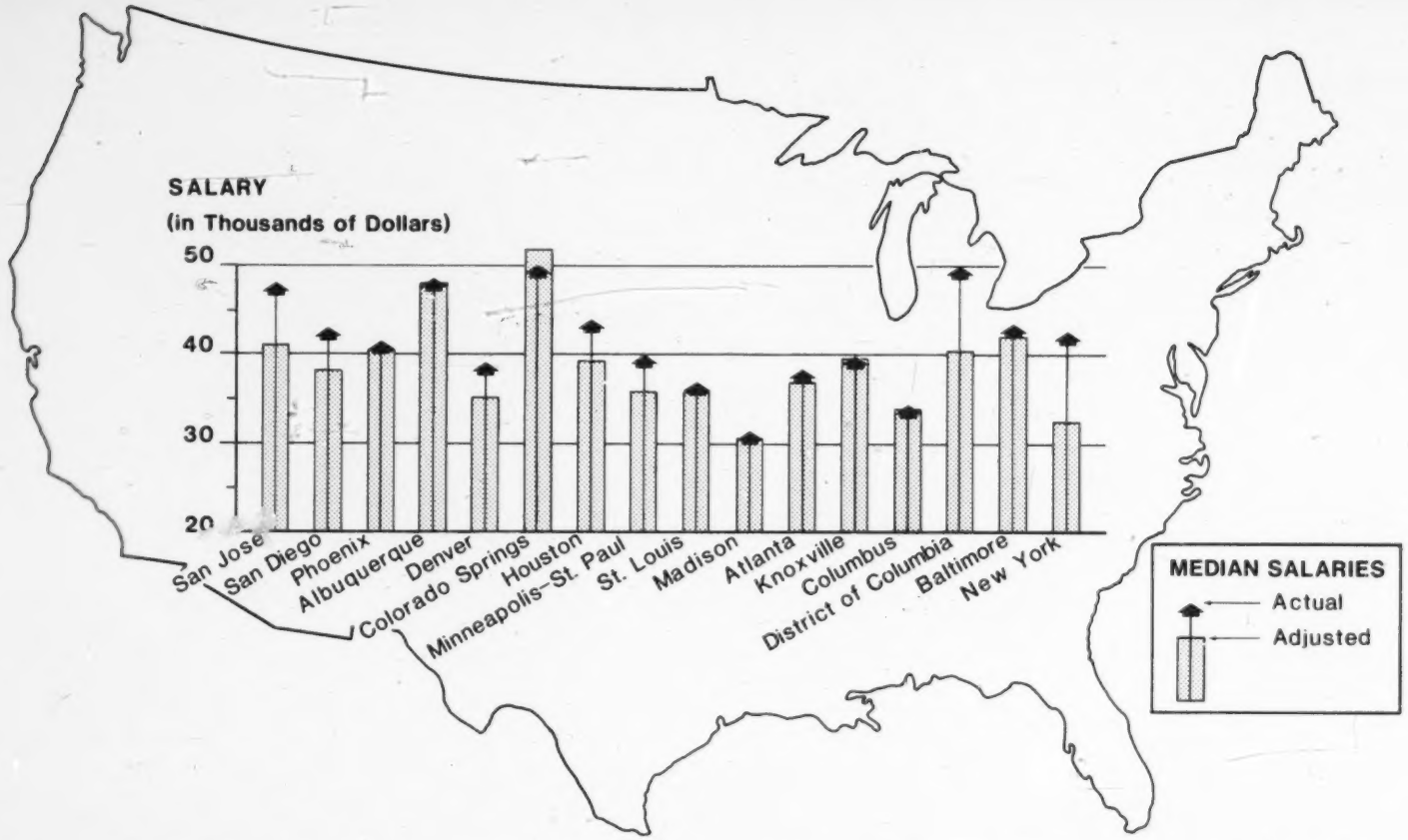

Figure 2. Median salaries for PhDs in each of 16 metropolitan areas, 1983. Both actual salaries and salaries adjusted for cost of living are presented.

• The Middle Atlantic is the only Division in the United States to suffer a population decrease between the 1970 and 1980 censuses. Despite this decrease, member salary increments remained high (18%) due to employment mobility into industry and industry's attempt to keep "high-tech" professionals in the Northeast.

• The large proportion of government employees living in the rapidly growing South Atlantic Division find their salary increases dampened by Federal salary ceilings. This lowers the Division's overall salary increase.

Table 5. 1983 median salaries adjusted for cost of living in selected metropolitan areas, PhDs. (a)

	Cost of Living Index	Median Salary	Adjusted Salary	Median Age	Academic %	Non-Academic %	Total Number Known
		(in thousands of dollars)					
Albuquerque	101.0	48.5	48.0	41	10	90	44
Atlanta	104.1	38.4	36.9	40	81	19	35
Baltimore	103.5	43.5	42.0	42	37	63	44
Colorado Springs	96.4	50.0	51.9	46	26	74	15
Columbus	101.0	34.3	34.0	43	63	37	31
Denver	111.7	39.2	35.1	41	35	65	24
District of Columbia	124.1	50.0	40.3	45	8	92	120
Houston	111.8	44.0	39.4	38	36	64	50
Knoxville	100.3	39.7	39.6	43	18	82	65
Madison	102.9	31.4	30.5	39	84	16	32
Minn/St. Paul	111.1	40.0	36.0	39	48	52	44
New York	131.7	42.5	32.3	45	53	47	126
Phoenix	102.8	41.6	40.5	37	48	52	15
St. Louis, MO	103.2	36.9	35.8	40	55	45	21
San Diego	112.5	43.0	38.2	42	20	80	46
San Jose	117.1	48.0	41.0	40	21	79	43

(a) Cost of Living Index from the American Chamber of Commerce Researchers Association, national average = 100.0

• The American Chamber of Commerce Researchers Association develops cost of living indexes for cities that submit information. Data are presented here for the major urban centers in which society members live. Since society members tend to live in the larger urban centers, and there is a direct relation between a city's size and its cost of living, all of the cities in Table 5 (with the exception of Colorado Springs) have a cost of living higher than the national average.

• New York City and the District of Columbia represent the largest and seventh largest metropolitan areas in the country, respectively. They also distinguish themselves as two of the most expensive cities in the continental United States. A large representation of well-paid Federal employees among society members in Washington compensates somewhat for the city's high cost of living, resulting in an adjusted median salary right around the national median for PhDs. New York City differs greatly from Washington in that the employer-type composition and overall median salary for PhDs are similar to that observed nationwide. Adjusting for the cost of living in New York thus produces a median salary for PhDs nearly $9,000 less than the national median.

• During the first quarter of 1983, PhDs living in Albuquerque, New Mexico, and Colorado Springs, Colorado enjoyed a relatively low cost of living and a high adjusted median salary. Colorado Springs' high median salary is somewhat deceptive in that the PhD members sampled were three years older than the national median age. This is not the case in Albuquerque though, where the sample group is two years younger than the national median and still maintains an adjusted salary $7,000 greater than society members nationwide.

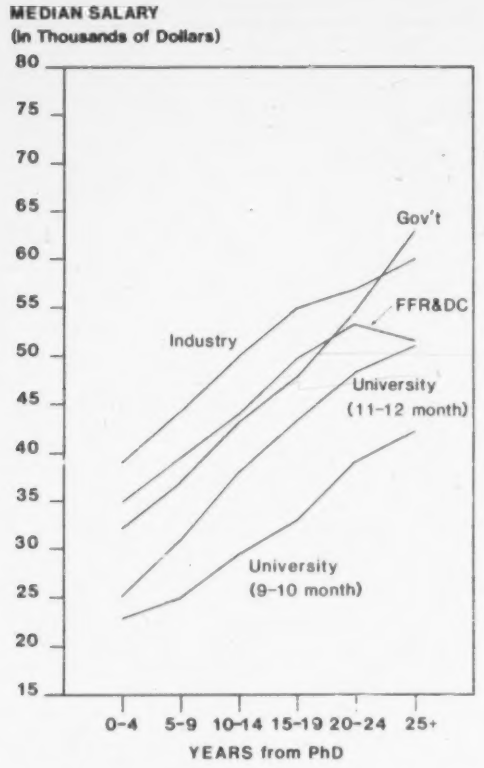

Figure 3. Median salaries by type of employer and years from PhD, 1983.

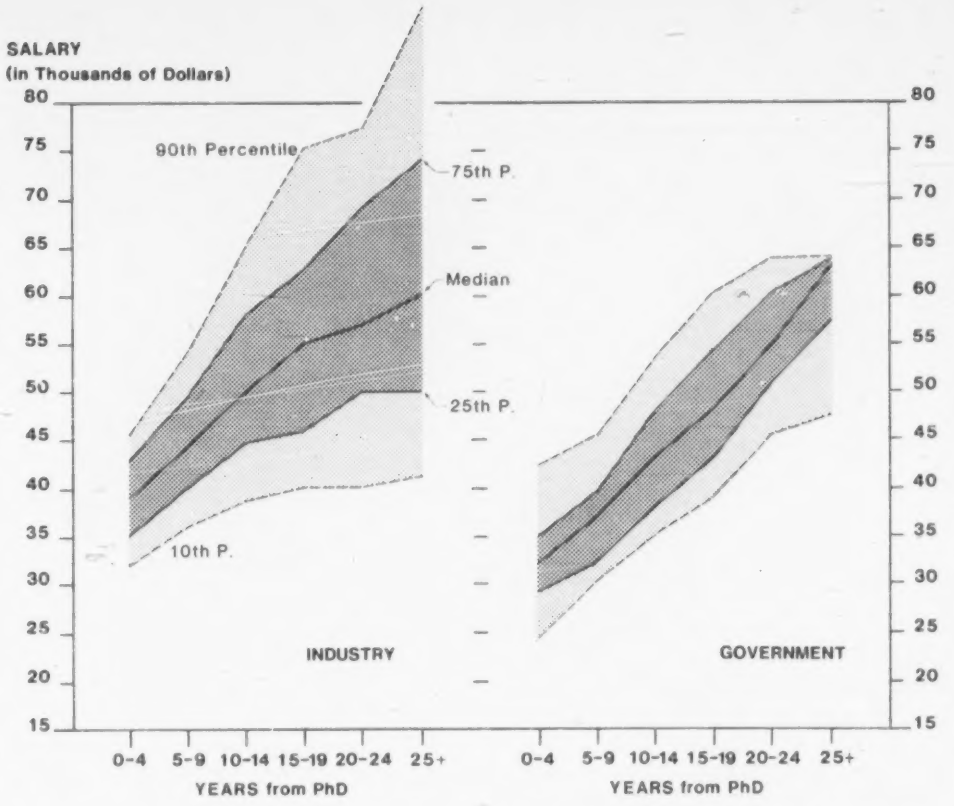

Figure 4. Salary structure in industry and government by years from PhD, 1983.

SALARIES AND EMPLOYER TYPE FOR PhDs

• Median salaries for society members with PhDs reached $41,000 in 1983, 7% higher than during the previous year. This increase was double the rate of inflation observed during this period.

• Industrially employed PhDs commanded the highest salaries, nearly $48,000; median salaries in government and national labs were somewhat lower at slightly over $45,000. While increases were not as high as they had been the previous year, they were still comfortably above inflation.

• Academic salaries were typically lower than those observed in non-academic spheres, with medians ranging from about $35,000 in the universities down to $26,000 in the four-year colleges. Increases, however, were above 7%, considerably more substantial than they had been during the previous year.

Table 6. 1983 salaries by major employer type, PhDs.

	Median Salary	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)				
University					
9-10 Month Salary	34.0	35.2	9.9	47	834
11-12 Month Salary	36.6	37.7	15.3	41	518
4-Year Colleges					
9-10 Month Salary	26.1	27.2	7.0	43	143
Industry/Self-Employed	47.7	50.7	15.3	40	1019
Government	45.4	46.3	11.1	44	361
FFR&DC	45.5	46.3	12.0	42	406
Nonprofit	42.4	43.8	14.7	42	124

Table 7. 1983 salaries by years from degree, PhDs.

Years from Degree	Median Salary	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)				
0-4	31.0	30.7	10.2	31	521
5-9	37.2	36.9	11.3	36	672
10-14	41.2	41.9	12.8	41	741
15-19	44.0	44.7	14.3	45	642
20-24	48.0	48.3	13.3	51	436
25-29	49.6	51.2	17.6	55	283
30+	51.2	53.1	15.5	61	314

Table 8. 1983 industrial salary structure by years from degree, PhDs.

Years from Degree	PERCENTILE SALARIES 10th	25th	Median	75th	90th	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)								
0-4	32.0	35.0	39.0	42.9	45.5	39.1	6.1	31	190
5-9	36.0	40.0	44.3	49.5	54.0	45.3	9.2	36	240
10-14	38.6	44.7	50.0	58.0	65.0	51.8	12.4	40	214
15-19	40.0	46.0	55.0	62.8	75.2	56.4	15.0	45	149
20-24	40.0	50.0	57.1	69.0	77.2	58.9	14.6	51	83
25+	41.1	50.0	60.0	74.0	90.0	63.8	21.2	59	137

Table 9. 1983 government salary structure by years from degree, PhDs.

Years from Degree	PERCENTILE SALARIES 10th	25th	Median	75th	90th	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)								
0-4	24.5	29.3	32.3	35.0	42.3	33.0	7.3	33	32
5-9	30.2	32.3	37.0	39.6	45.4	37.0	6.1	37	64
10-14	35.0	38.0	43.2	48.0	53.3	43.5	7.3	41	91
15-19	38.9	43.0	48.0	54.1	60.0	48.6	8.4	45	67
20-24	45.4	50.9	54.7	60.0	63.8	54.7	7.6	52	54
25+	47.5	57.2	63.1	63.8	63.9	59.5	6.9	59	52

• Salaries climb with professional experience; in most employment sectors the increment is relatively steady for the first 15 years after an individual receives the PhD and then levels off. Industrial salaries remain the highest at most levels of experience. For the first 20 years after the PhD, national lab salaries fluctuate about $2,000 above government salaries. For the most experienced scientists, however, national lab salaries level off markedly while government salaries continue to escalate, even surpassing the median industrial salary at 25 years after the PhD.

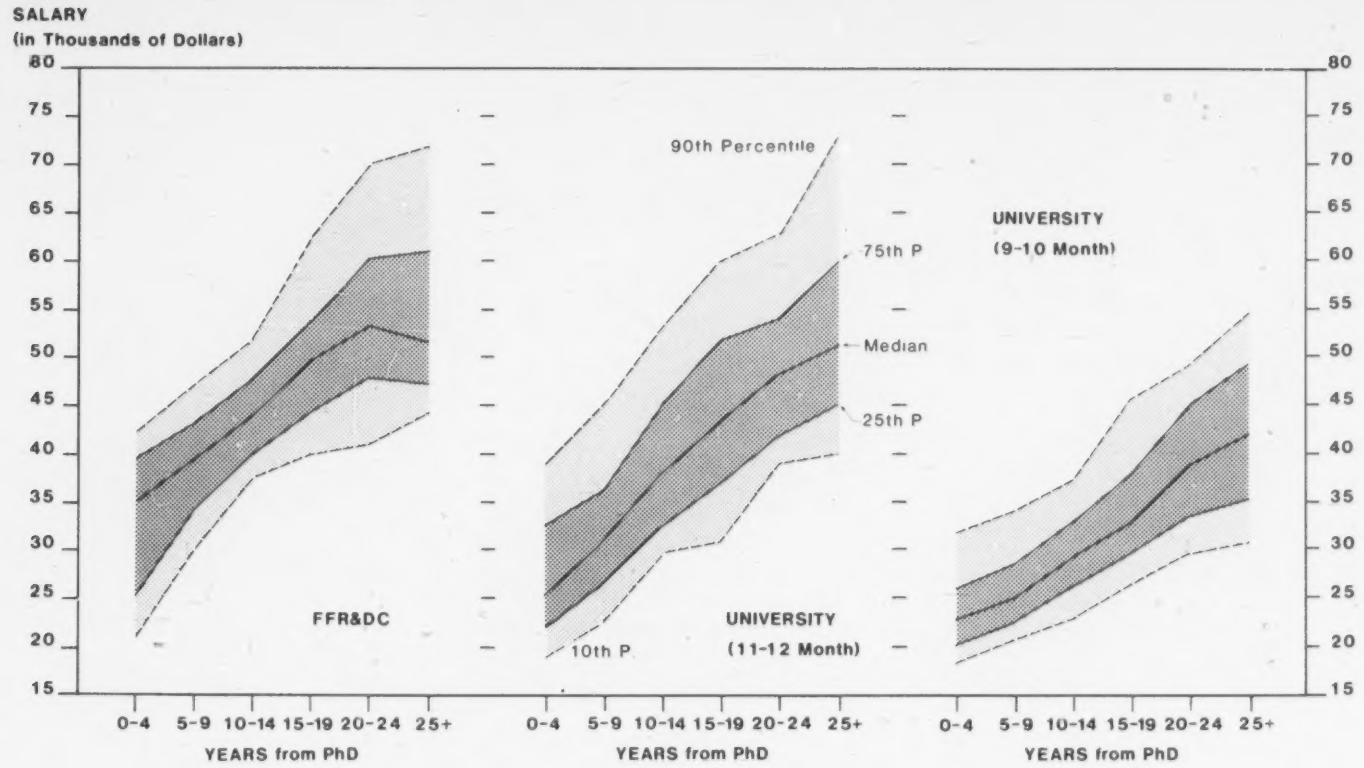

Figure 5. Salary structure in the national laboratories and universities by years from PhD, 1983.

• Industrial salaries for both beginning and experienced scientists rose at a faster pace than inflation in 1983. Increases in government salaries were generally tight across the experience spectrum, except for PhDs with 25 or more years of experience, reflecting the raising of the Federal salary ceiling. For experienced scientists at the national labs and the universities increases were volatile.

• Salary ranges at each experience level within industry were wider than in any other sector of the economy and were broader than the ranges observed in earlier years. As professional experience increases, the range in salaries broadens, reflecting the multiple research and administrative career paths available in industry. The top ten percent of the most experienced industrial PhD scientists were rapidly approaching the $100,000 salary mark.

Table 10. 1983 FFR&DC salary structure by years from degree, PhDs.

Years from Degree	PERCENTILE SALARIES (in thousands of dollars) 10th	25th	Median	75th	90th	Mean Salary	Standard Deviation	Median Age	Total Number Known
0-4	21.0	25.0	35.0	39.5	42.3	33.6	9.6	31	48
5-9	30.0	34.2	39.6	43.4	47.3	39.0	6.8	35	68
10-14	37.5	40.0	44.1	48.0	52.0	44.3	5.8	41	96
15-19	40.0	44.6	49.7	53.6	62.5	50.7	9.9	45	74
20-24	41.0	48.0	53.4	60.2	70.0	54.7	12.0	50	49
25+	44.3	47.2	51.7	61.0	72.0	55.5	12.6	58	68

Table 11. 1983 university 11-12 month salary structure by years from degree, PhDs. (a)

Years from Degree	PERCENTILE SALARIES (in thousands of dollars) 10th	25th	Median	75th	90th	Mean Salary	Standard Deviation	Median Age	Total Number Known
0-4	18.8	22.0	25.2	32.5	39.0	27.6	8.4	31	44
5-9	22.8	26.7	31.0	36.2	45.0	32.5	8.6	36	91
10-14	29.5	32.3	38.0	45.0	53.2	39.4	11.5	41	77
15-19	31.1	37.0	43.4	52.0	60.0	45.5	13.4	45	86
20-24	39.2	42.0	48.5	54.0	63.0	49.5	9.3	50	51
25+	40.0	45.1	51.1	60.0	73.0	53.1	12.5	58	77

(a) In addition, there are 69 postdocs in the 0-4 years from degree group with known salaries working in universities on an 11-12 month salary base. Their median salary is $18,400.

Table 12. 1983 university 9-10 month salary structure by years from degree, PhDs. (a)

Years from Degree	PERCENTILE SALARIES (in thousands of dollars) 10th	25th	Median	75th	90th	Mean Salary	Standard Deviation	Median Age	Total Number Known
0-4	18.5	20.3	23.0	26.1	32.0	24.2	5.2	32	50
5-9	20.9	22.6	25.1	28.7	34.1	26.4	5.2	36	91
10-14	23.0	26.4	29.5	33.0	37.5	30.1	5.9	41	133
15-19	26.5	29.9	33.0	38.0	45.8	34.5	7.5	45	191
20-24	29.8	33.8	39.0	45.2	49.3	39.6	7.9	50	148
25+	31.0	35.5	42.2	49.5	55.0	42.8	9.5	59	215

(a) Postdocs excluded

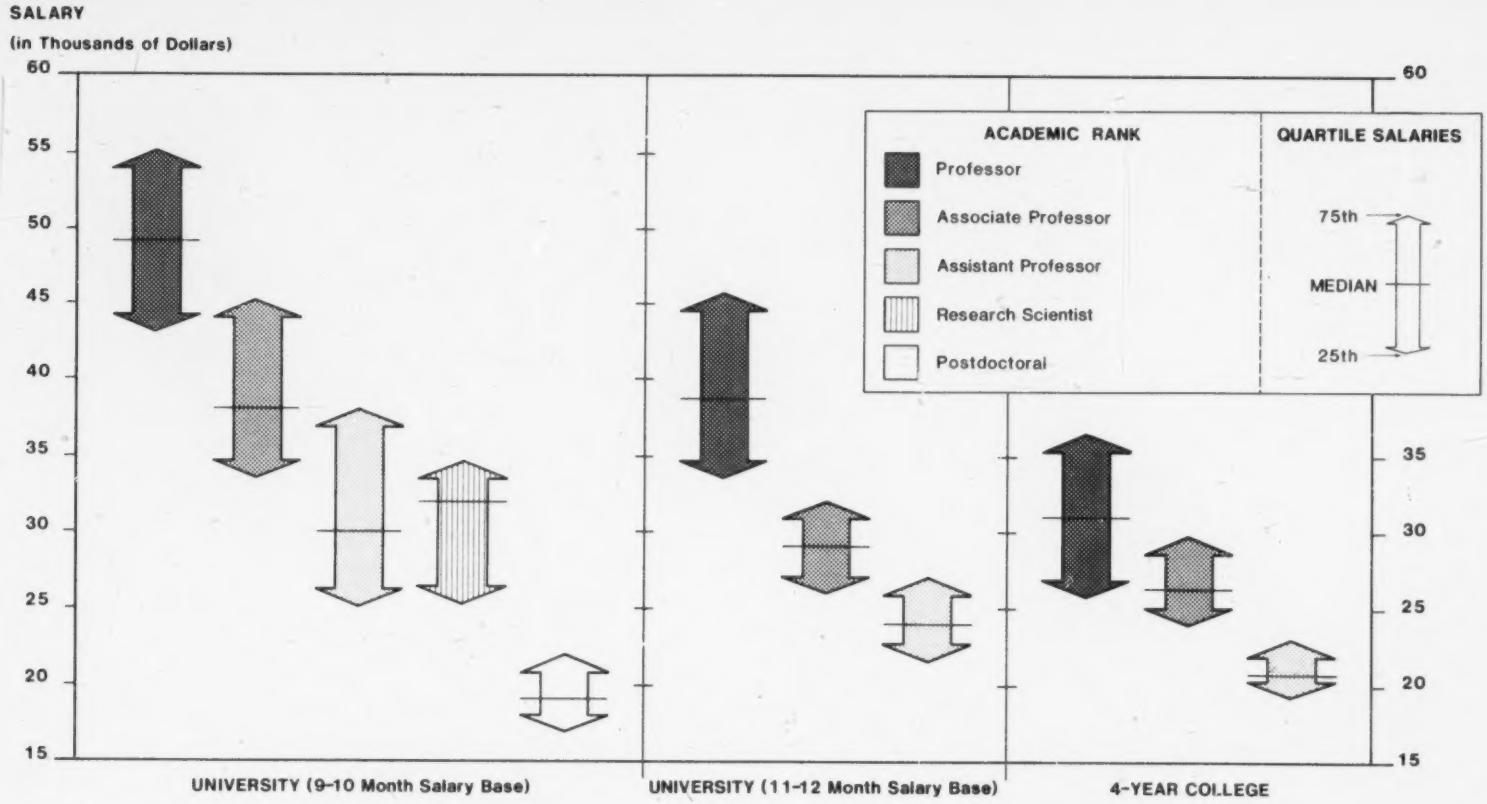

Figure 6. University and 4-year college salaries for PhDs by academic rank, 1983.

• Government salary ranges were considerably narrower than those observed in industry. Although these ranges widened somewhat during ensuing years, they tightened again at the most advanced levels of experience as the effect of the Federal salary ceilings set in. In 1983, top paid government scientists were drawing about $64,000.

• Salary ranges at the national laboratories are relatively wide at the starting level due, in part, to the inclusion of lower paid postdoctoral positions. The range in salaries is then narrow through the mid-career stages, expanding only slightly as some of the most experienced scientists move into administration. Top salaries reach beyond $70,000.

• The typical 9–10 month university salaries have a relatively narrow range which expands slowly but regularly as a function of experience; the 11–12 month salary ranges are both broader and more variable, reflecting a diversity of academic positions including non-tenure line research staff, administrative personnel and professors with Federal grant-based salaries.

Table 13. 1983 university salaries by selected academic rank and salary base, PhDs.

	QUARTILE SALARIES 25th	Median	75th	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)						
Professor							
9-10 Month Salary	33.6	38.8	45.6	40.0	8.7	51	519
11-12 Month Salary	43.0	49.0	55.0	50.4	10.5	51	173
Associate Professor							
9-10 Month Salary	26.0	29.0	32.0	29.2	4.5	42	179
11-12 Month Salary	33.4	38.0	45.0	40.8	13.2	41	73
Assistant Professor							
9-10 Month Salary	21.6	24.0	27.0	24.3	4.1	34	117
11-12 Month Salary	25.0	30.0	38.0	33.2	13.6	34	58
Research Associate (11-12 Month Salary)							
Postdoctorates	17.0	19.1	22.0	19.5	3.6	31	74
Other Research Staff	25.2	32.0	34.6	30.8	7.4	38	59

Table 14. 1983 4-year college salaries by selected academic rank on 9-10 month salary, PhDs.

	QUARTILE SALARIES 25th	Median	75th	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)						
Professor	25.8	31.0	36.5	30.9	6.8	48	59
Associate Professor	23.9	26.3	29.8	26.9	5.0	43	45
Assistant Professor	19.2	20.7	22.9	21.9	5.6	36	36

Salaries and Academic Rank

• Within the university sector, the median salary for most academic ranks increased by nearly 7% between 1982 and 1983. The notable exception was in postdoctoral positions, where the median salary climbed less than the inflation rate (3 vs. 3.6%).

• In 1983, society members employed in universities on a 9–10 month salary base earned slightly more ($600–900) at each professorial rank than the national average for all disciplines.[2]

• PhDs employed in universities on an 11–12 month contract received considerably more ($3500–4500) than the national average for all disciplines. This differential is due, in part, to the prevalence of research grant-based salaries for the society members in this group.

• University research staff, who were research scientists and principal investigators rather than postdocs, had a salary structure closely resembling that of assistant professors on 11–12 month contracts. However, as a group these researchers were four years older than assistant professors and seven years older than postdocs.

• Aging of the university professoriate continues to be a serious concern for the physics community. Full professors had a median age of 51 and comprised over 60% of the society members who held professorial ranks in the university sector. By comparison, the national average across disciplines is only 42% in the full professor ranks.

[2]NCES, unpublished data on 1983 faculty salaries.

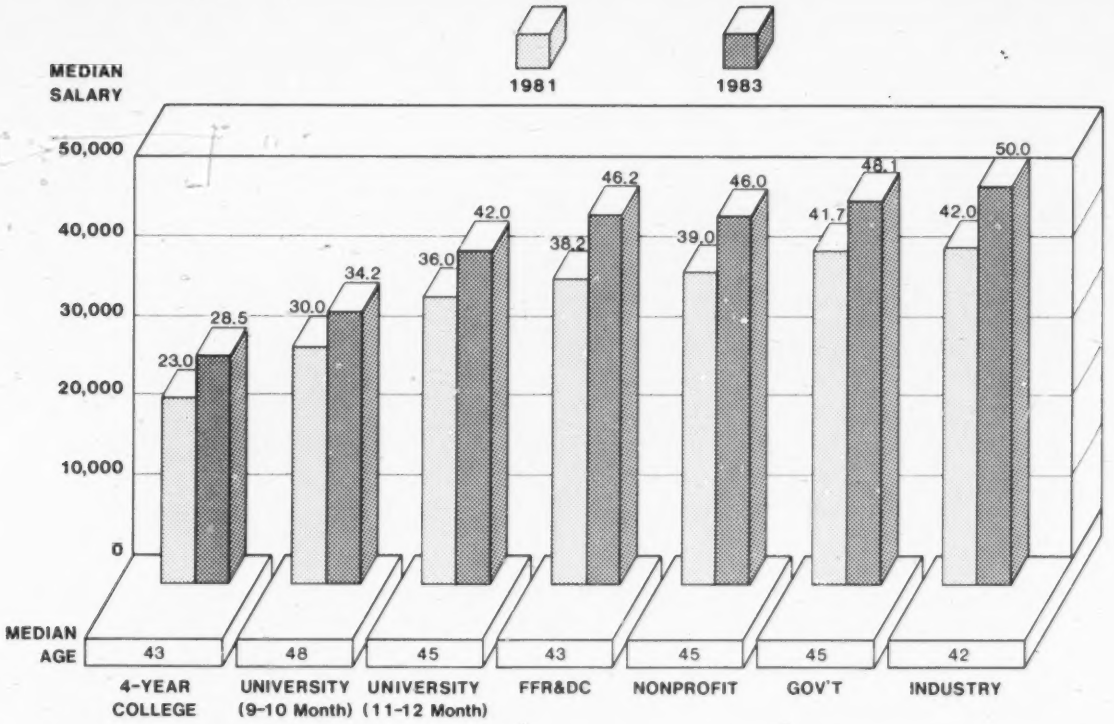

Figure 7. 1981 and 1983 median salaries by employer type for PhDs remaining with the same employer.

• Within the four year colleges, the median salary for the professorial ranks increased by 6%. In general, college faculty on 9–10 month contracts earned approximately 15% less than their colleagues holding similar ranks in the universities.

• Typical salaries (as measured by the interquartile range) varied the most for the university professoriate on 11–12 month contracts. Although the actual salary levels differ, the range of typical salaries for the four-year college professoriate was very similar to that of their colleagues in the universities, except for the college-employed assistant professor who had the narrowest range of typical salary among all major academic ranks.

Salary Increases and Employer Type, 1981–83.

• Median salaries for PhDs who remained with the same employer from 1981 to 1983 showed increases in the 14–24% range, comfortably ahead of the 10.7% inflation rate for that two-year period.

• Despite the fact that the inflation rate declined between 1981 and 1983, PhDs received salary increases during 1982–83 comparable to those for 1981–82. It is likely that as the inflation rate continues to stay low, the size of future salary increments will come down.

Table 15. 1981 and 1983 salaries for members continuing employment by selected employer type, PhDs. (a)

	Salary Year	Median Salary	Mean Salary	Standard Deviation	Median Age	Total Number Known
		(in thousands of dollars)				
UNIVERSITY						
(9-10 month salary base)	1981	30.0	31.5	8.4		
	1983	34.2	36.1	9.4	48	542
(11-12 month salary base)	1981	36.0	36.4	11.7		
	1983	42.0	42.5	13.5	45	266
4-YEAR COLLEGE						
(9-10 month salary base)	1981	23.0	24.2	6.1		
	1983	28.5	28.3	6.8	43	96
INDUSTRY	1981	42.0	45.6	14.9		
	1983	50.0	52.9	14.6	42	587
GOVERNMENT	1981	41.7	41.4	7.7		
	1983	48.1	48.6	10.1	45	247
FFR&DC	1981	38.2	39.6	9.3		
	1983	46.2	47.6	10.6	43	288
NONPROFIT	1981	39.0	41.5	13.3		
	1983	46.0	47.8	13.9	45	72

(a) Data based on society members who responded in both 1981 and 1983, were full-time employed, and did not change employers in the years 1981-83.

• In general, median salaries for PhDs climbed by $4000–8000 during the two years. Industry and the national laboratories employed the youngest PhDs and awarded them both the highest salary increments and among the highest salary levels.

• By contrast, university-employed society members were the oldest group of PhDs, earned salary levels that were among the lowest of the major employment sectors and received one of the lowest salary increments during that two-year period.

• Although PhDs employed in the four-year colleges earned the lowest salary levels, they did receive the highest percentage increase in salary, nearly 12% in each of the two years.

Salary Increases within Universities, 1981–83

• Society members who were employed in universities and did not change their professorial rank over the two years from 1981 to 1983 received increases in median salary in the range 13–18%, with full professors at the lower end of that range and assistant professors at the upper end.

• Depending upon their position, researchers in universities received divergent salary increases over the two years. PhDs who remained postdocs were given the lowest salary increments and barely kept ahead of the 1981–83 inflation rate (11 vs. 10.7%). The non-postdoc research staff on the other hand were awarded the largest salary increases, nearly 19% over the two years.

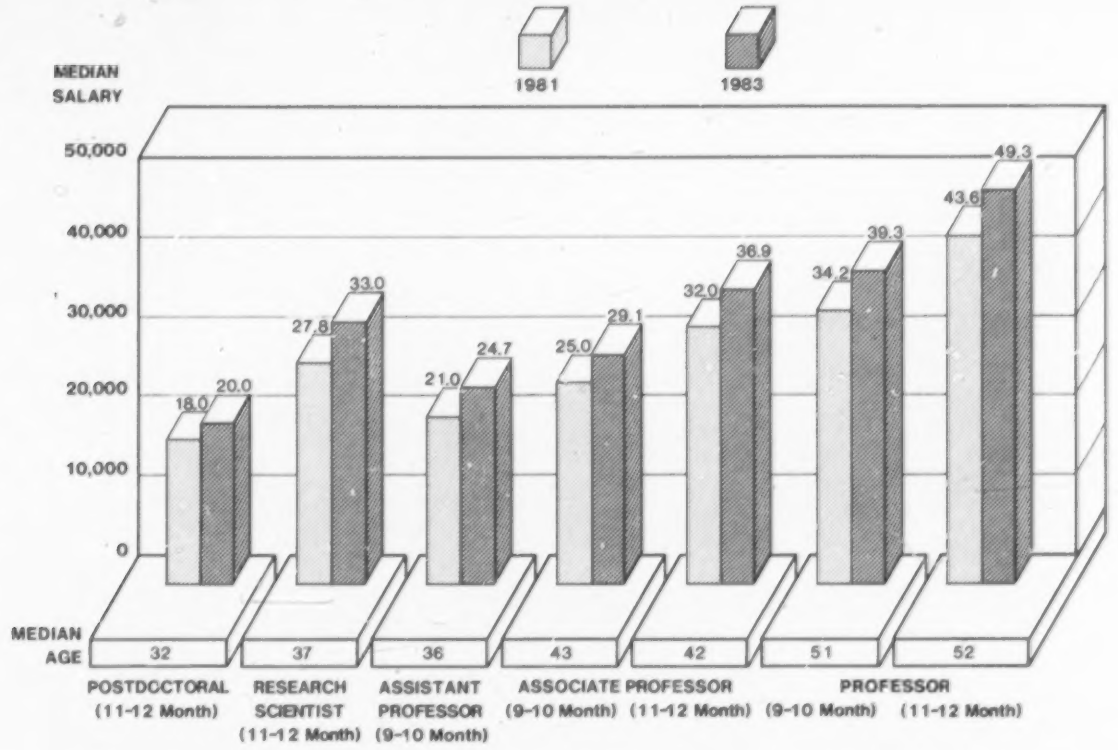

Figure 8. 1981 and 1983 median salaries by academic rank for PhDs remaining within the same rank.

Salary Increases and Employer Changes, 1981–83

- The magnitude of the salary change for PhDs who changed employers between 1981 and 1983 reflects two phenomena: the individual's relative position within the salary structure of his or her 1981 employer and the overall differences in salary levels paid by the major employment sectors.

- Salary levels differ widely between the university sector and the principal nonacademic employment areas: industry, government, and the national laboratories. PhDs who left universities and moved into one of the latter areas were among the youngest employment changers, were receiving salaries far down the scale from their employer in 1981 and received the most substantial gains in salary by 1983.

- Postdocs are the youngest and the lowest paid of all major PhD groups. Of the postdocs who changed employers but remained in universities, half took another postdoctoral position and another third were promoted to assistant professors.

Table 16. 1981 and 1983 salaries for members continuing to work in universities by academic rank, PhDs.

	Salary Year	Median Salary (in thousands of dollars)	Mean Salary	Standard Deviation	Median Age	Total Number Known
Full Professor	1981	34.2	35.3	7.6		350
9-10 month	1983	39.3	40.2	8.7	51	
Full Professor	1981	43.6	44.7	9.1		105
11-12 month	1983	49.3	50.9	9.9	52	
Associate Professor	1981	25.0	25.4	3.5		98
9-10 month	1983	29.1	29.1	4.1	43	
Associate Professor	1981	32.0	35.6	8.5		22
11-12 month	1983	36.9	41.9	11.7	42	
Assistant Professor	1981	21.0	21.4	3.1		38
9-10 month	1983	24.7	25.4	3.6	36	
Research Associate (11-12 month)						
Postdoctorate	1981	18.0	17.8	2.1		17
	1983	20.0	20.9	3.4	32	
Other Research Staff	1981	27.8	28.0	6.0		28
	1983	33.0	33.3	6.7	37	

Table 17. 1981 and 1983 salaries for members who changed employers during the two years, PhDs.

	Salary Year	Median Salary (in thousands of dollars)	Mean Salary	Standard Deviation	Median Age	Total Number Known
University (Postdocs)	1981	16.5	16.8	3.2		25
University(a)	1983	22.9	22.6	3.3	33	
University (not Postdoc)	1981	31.5	32.4	11.4		26
University	1983	36.2	39.8	14.3	40	
University	1981	22.6	23.6	8.5		27
Industry	1983	41.8	40.6	8.4	35	
Industry	1981	37.0	39.9	9.6		72
Industry	1983	48.0	49.6	11.3	38	

(a) Half of these PhDs were still postdocs in 1983. Another third were assistant professors.

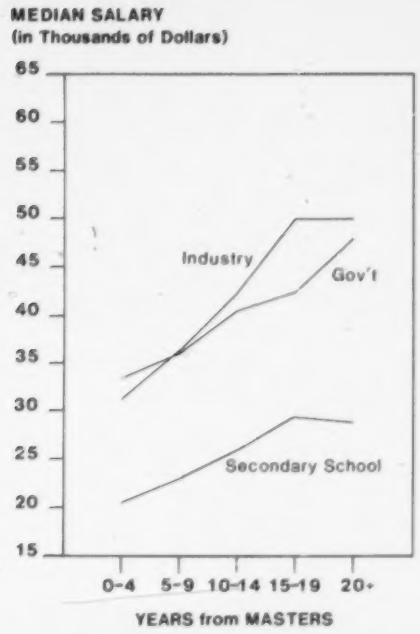

Figure 9. Median salaries in industry, government, and secondary schools by years from Masters degree, 1983.

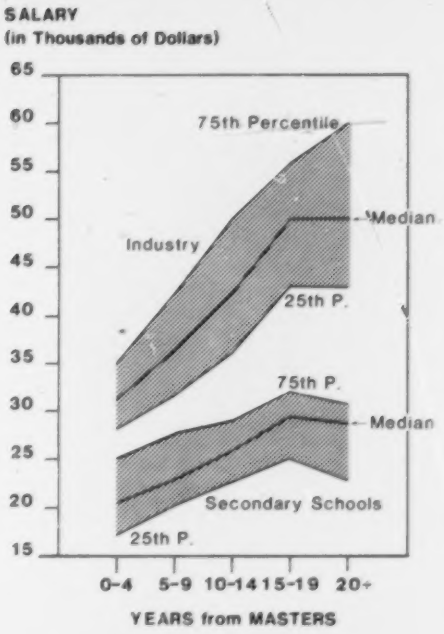

Figure 10. Salary structure in industry and secondary schools by years from Masters degree, 1983.

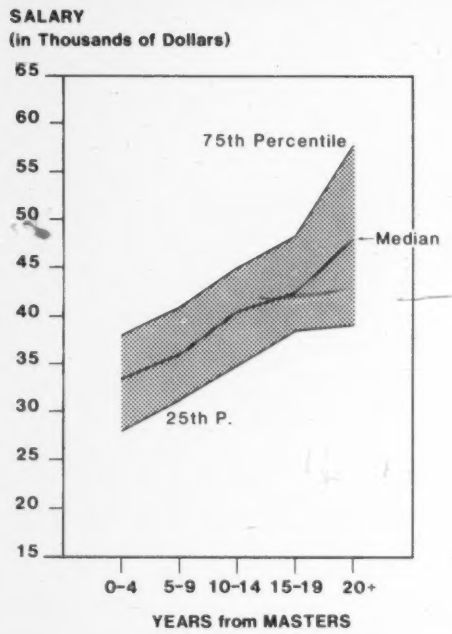

Figure 11. Salary structure in government by years from Masters degree, 1983.

• By contrast, the other PhDs who changed employers within the university sector between 1981 and 1983 were one of the oldest groups who made employment changes, were close to the middle of the university pay scale in 1981 and received salary increments comparable to those earned by PhDs who remained with the same university employer over that period of time.

• PhDs who changed employers within industry or among industry, government and the national labs, were typically 7–10 years from their degree, were receiving salaries below the median for their employer in 1981 and moved closer to the median salary awarded in their 1983 employment sector.

SALARIES AND EMPLOYER TYPE: MASTERS AND BACHELORS

• Society members who hold Masters degrees are chiefly employed by industry (41%), secondary schools (18%), and government (12%). Three-quarters of the society members who work in secondary schools hold Masters degrees.

• Median salaries in excess of $40,000 are observed for Masters working in industry, government, and at national laboratories. Median salaries in all academic areas, including secondary schools, cluster in the $25,000–$28,000 range, except for the higher salaries received by the university group on 11–12-month contracts (research support staff for the most part).

Table 18. 1983 salaries by selected employer type, Masters.

	Median Salary	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)				
University (9-10 month)	28.0	27.9	6.8	61	18
University (11-12 month)	34.4	34.4	11.1	46	23
4-Year College	25.5	25.7	7.2	51	28
Junior College	28.0	27.5	5.8	45	50
Secondary School	26.4	26.9	5.9	45	146
Industry/Self-Employed	43.0	45.1	15.5	43	336
Government	42.0	42.8	9.8	45	97
FFR&DC	41.0	41.6	9.0	44	35
Nonprofit	38.0	39.5	9.6	36	43

Table 19. 1983 salaries by selected type of employer and years from degree, Masters.

	Years from Degree	QUARTILE SALARIES 25th	Median	75th	Mean Salary	Standard Deviation	Median Age	Total Number Known
		(in thousands of dollars)						
Secondary School	0-4	17.2	20.5	25.0	21.6	5.6	34	12
	5-9	20.2	23.0	27.8	24.0	5.1	40	20
	10-14	22.7	25.9	29.0	26.6	4.9	42	46
	15-19	25.0	29.5	32.1	29.5	5.1	46	32
	20+	23.0	28.9	30.9	28.4	6.6	55	34
Industry	0-4	28.2	31.4	35.0	32.1	7.8	30	45
	5-9	31.5	36.3	42.2	38.0	11.9	32	73
	10-14	36.0	42.2	50.0	45.2	16.6	39	44
	15-19	43.0	50.0	56.0	50.3	12.7	45	50
	20+	43.0	50.0	60.0	52.2	15.4	55	120
Government	0-4	28.0	33.5	38.0	34.2	7.2	34	10
	5-9	31.3	36.0	41.0	37.2	8.1	37	13
	10-14	34.9	40.5	45.0	40.1	6.3	40	18
	15-19	38.5	42.5	48.4	43.4	7.0	45	17
	20+	39.1	48.0	57.7	48.4	10.6	56	36

• The few Masters working in four-year colleges or in universities on academic-year contracts are substantially older than individuals working in other sectors.

• Salary structures by experience level indicate that Masters at secondary schools, no matter how long they have been in the labor force, have lower average earnings than the most recently graduated Masters working in government and industry.

• Two special characteristics of the secondary school Masters should be noted here: (1) median ages at each level of experience are higher than those in industry and government, which suggests that a pattern of upgrading Bachelors to Masters degrees during the period of employment is common. (2) More than half of the Masters degrees are in Education or Administration, categories rarely found among society members working in industry or government.

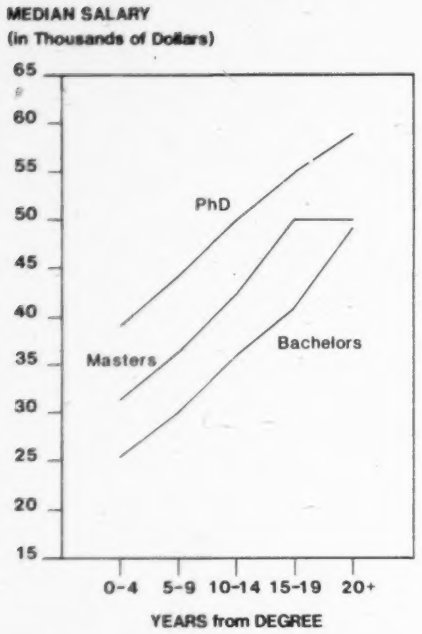

Figure 12. Median salaries in industry by degree level and years from degree, 1983.

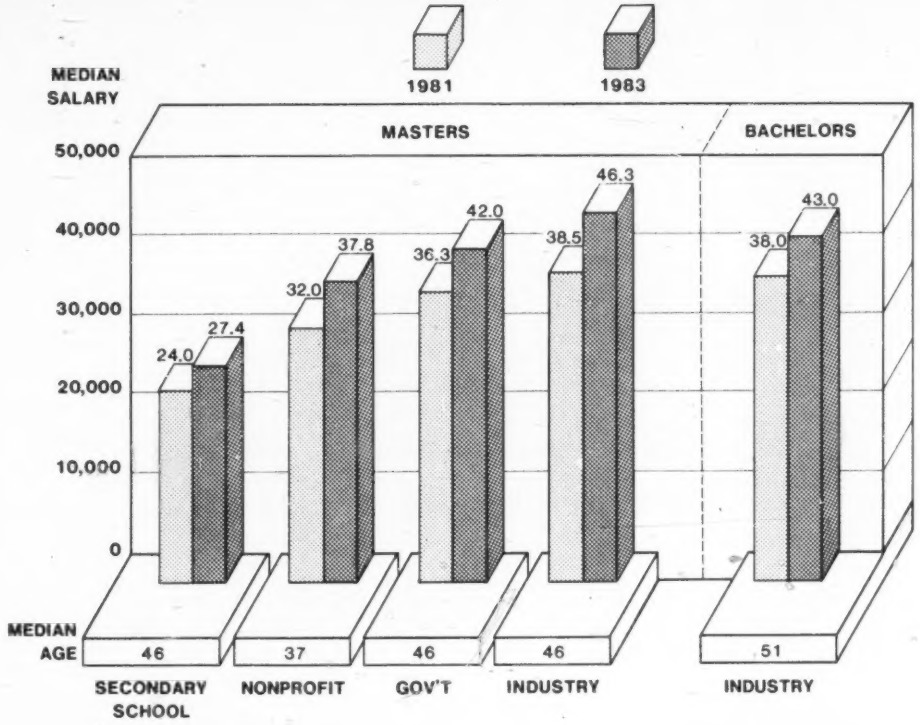

Figure 13. 1981 and 1983 median salaries by employer type for Masters and Bachelors remaining with the same employer.

• At advanced experience levels, Masters in industry enjoy a modest salary advantage over those in government. Differences in age structure partially obscure the salary advantages of industrial employment for those less than ten years from degree.

• One significant difference between government and industry concerns salaries that fall within the top quartile. High government salaries, unlike high industrial salaries, cluster just above the upper quartile boundary, reflecting the wide variety of career paths in industry, on the one hand, and government salary ceilings, on the other.

• Most Bachelors are employed by industry (64%). smaller subgroups work in government (11%) and at secondary schools (8%).

• Median salaries for Bachelors in industry, by level of experience, can be compared to similar data for PhDs and Masters. The salary difference between degree levels in this figure is fairly uniform, ranging from $5,000 to $9,000 for groups with less than 20 years of experience. After that point, Masters' salaries level off, while Bachelors' salaries apparently continue to climb. The latter is, in part, an artifact of these Bachelors having been in the labor force five years longer than the Masters.

Table 20. 1983 industrial salaries by years from degree, Bachelors.

	Median Salary	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)				
0-4	25.6	26.1	5.0	26	27
5-9	30.0	32.3	6.6	29	46
10-14	36.0	38.0	10.6	36	28
15-19	41.0	42.7	12.9	43	29
20+	48.5	50.0	15.0	47	33

Table 21. 1981 and 1983 salaries for members continuing employment by employer type, Masters and Bachelors.

	Salary Year	Median Salary	Mean Salary	Standard Deviation	Median Age	Total Number Known
		(in thousands of dollars)				
MASTERS						
Secondary School	1981	24.0	24.1	5.1		
	1983	27.4	27.5	5.8	46	90
Junior College	1981	25.6	25.9	5.6		40
	1983	28.0	28.2	5.2	46	
Industry	1981	38.5	40.7	15.1		
	1983	46.3	47.3	15.3	46	182
Government	1981	36.3	37.7	7.7		
	1983	42.0	43.4	9.1	46	64
Nonprofit	1981	32.0	32.8	5.2		
	1983	37.8	39.6	7.2	37	26
BACHELORS						
Industry	1981	38.0	40.1	21.6		
	1983	43.0	44.8	22.6	51	117

• Median salaries for Bachelors working in industry, government, and the national labs cluster in the neighborhood of $40,000, double the median for secondary schools. Although different age structures account for part of this gap, the bulk of it results from dramatically different starting salary levels.

• Changes in median salary for Bachelors and Masters who stayed with the same employer from March 1981 to March 1983 vary according to employer type. Masters employed in junior colleges received the lowest salary increments and did not keep up with the combined inflation rate for that two year period (9 vs 10.7%).

• By contrast, Masters in industry received the highest salary increases, 20%. This was one and a half times the increase that Bachelors in industry received between 1981 and 1983.

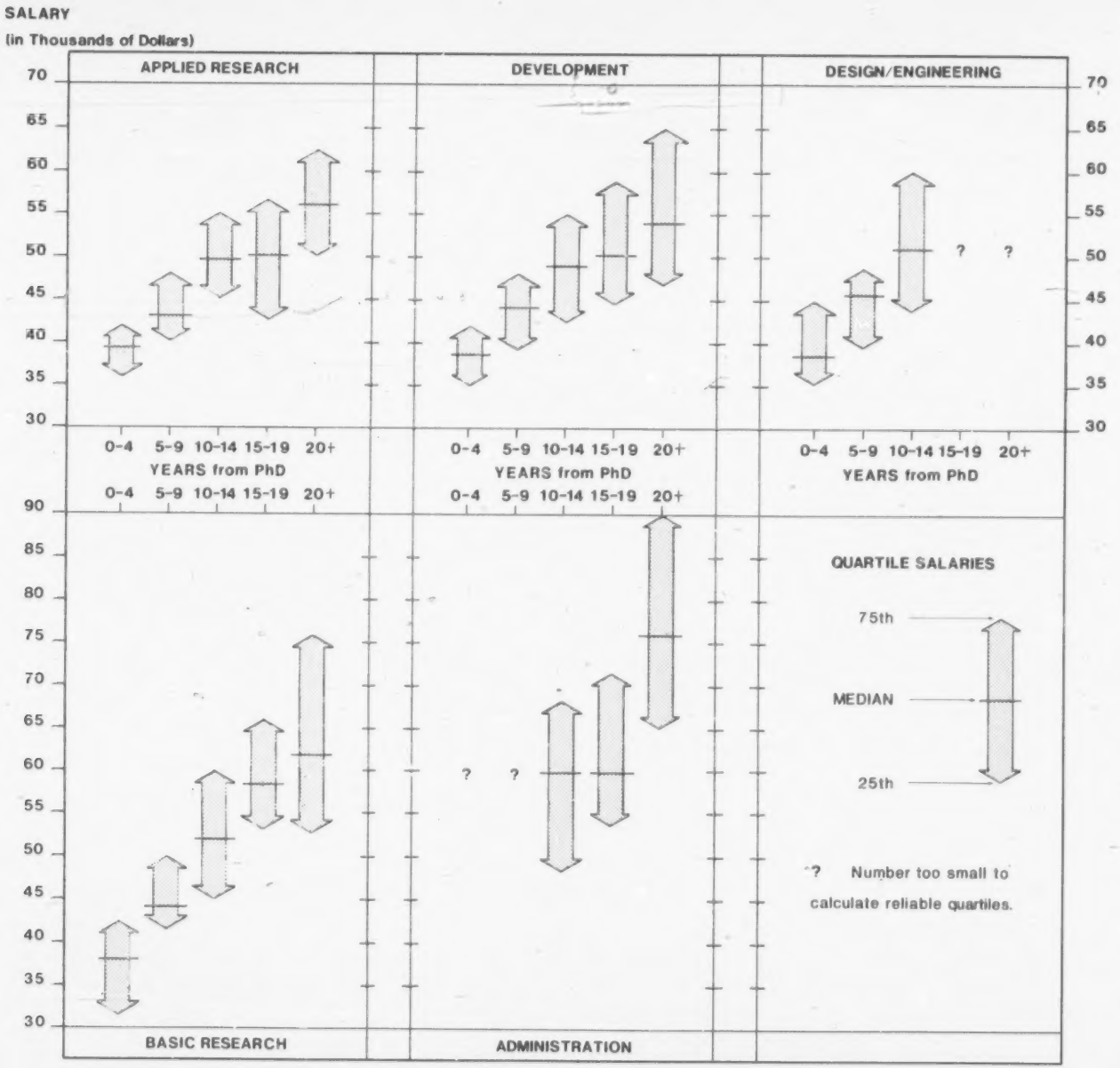

Figure 14. Industrial salaries by primary work activity and years from PhD, 1983.

Table 22. 1983 industrial salaries by primary work activity and years from degree, PhDs.

Years from Degree	QUARTILE SALARIES 25th	Median	75th	Mean Salary	Standard Deviation	Median Age	Total Number Known
	(in thousands of dollars)						
Basic Research							
0-4	31.5	38.0	42.4	37.4	7.0	30	36
5-9	41.6	44.1	50.0	45.6	8.1	35	35
10-14	45.0	52.0	60.0	51.5	10.8	40	25
15-19	53.2	58.4	66.0	61.4	11.5	45	20
20+	52.8	61.8	76.0	66.4	19.4	57	22
Applied Research							
0-4	36.0	39.3	42.0	39.3	4.4	31	78
5-9	40.0	43.0	48.0	43.7	6.3	36	105
10-14	45.0	49.5	55.0	49.3	10.6	41	76
15-19	42.5	50.0	56.5	51.2	12.6	46	45
20+	50.0	56.0	62.3	56.7	11.6	55	79
Development							
0-4	35.0	38.6	41.9	38.7	6.4	32	34
5-9	39.1	44.0	48.0	42.9	6.3	37	32
10-14	42.4	49.0	55.0	49.8	10.7	41	42
15-19	44.5	50.3	58.9	51.2	11.0	45	28
20+	46.8	54.0	65.0	56.0	13.1	57	35
Design/Engineering							
0-4	35.2	38.5	44.9	39.8	5.8	32	24
5-9	39.5	45.5	48.6	44.8	6.7	35	39
10-14	43.7	51.0	60.0	53.8	13.5	39	21
15-19		*					
20+		*					
Administration							
0-4		*					
5-9		*					
10-14	48.5	60.0	68.2	60.1	15.5	40	30
15-19	53.6	60.0	71.5	65.5	19.2	45	30
20+	65.0	76.0	90.0	77.8	23.8	55	51

* Number too small to calculate reliable quartiles.

SALARIES AND PRIMARY WORK ACTIVITY

• A detailed examination of PhDs employed in industry reveals that entry-level median salaries are remarkably similar for most work activities. Individuals working in applied research and development maintain comparable salary levels throughout their careers while society members involved in industrial basic research earn markedly higher salaries after 15 years of experience.

Table 23. 1981 and 1983 salaries for members continuing in the same principal work activity, PhDs.

	Salary Year	Median Salary (in thousands of dollars)	Mean Salary	Standard Deviation	Median Age	Total Number Known
Teaching	1981	28.4	29.5	8.5		
	1983	32.0	33.4	9.1	47	574
Basic Research	1981	34.2	34.9	11.3		
	1983	40.0	41.2	12.9	42	735
Applied Research	1981	38.5	39.4	9.1		
	1983	45.4	46.9	10.5	42	514
Development	1981	40.0	40.4	9.0		
	1983	46.2	47.6	10.1	42	130
Design/Engineering	1981	39.0	39.4	7.4		
	1983	46.3	47.6	9.7	38	77
Administration	1981	50.0	51.6	17.8		
	1983	58.3	59.3	16.4	49	273

Table 24. 1981 and 1983 salaries for members continuing in the same principal work activity, Masters.

	Salary Year	Median Salary (in thousands of dollars)	Mean Salary	Standard Deviation	Median Age	Total Number Known
Teaching	1981	25.0	24.5	5.1		
	1983	28.0	27.6	5.6	47	156
Applied Research	1981	35.8	36.7	10.7		
	1983	41.5	43.7	13.3	45	74
Development	1981	36.0	37.8	9.5		
	1983	42.7	43.7	9.4	44	59
Design/Engineering	1981	34.6	36.7	10.9		
	1983	43.0	43.4	10.3	44	60
Administration	1981	45.0	47.2	18.3		
	1983	51.5	54.0	17.4	48	62

• While variations in salaries are most strongly influenced by type of employer and extent of professional experience, the kind of work individuals do also affects their salary levels. During the two-year period ending in March 1983, PhD society members across all work activity areas received increases greater than the rate of inflation. These increases ranged from 13% for individuals in teaching to a high of 19% for those involved in design/engineering.

Table 25. 1981 and 1983 salaries for members continuing in the same principal work activity, Bachelors.

	Salary Year	Median Salary (in thousands of dollars)	Mean Salary	Standard Deviation	Median Age	Total Number Known
Teaching	1981	19.5	19.1	4.2		
	1983	22.1	21.9	4.3	38	22
Applied Research	1981	37.0	35.5	10.5		
	1983	40.0	39.8	10.8	49	39
Development	1981	37.0	40.6	19.2		
	1983	43.0	45.5	15.5	49	34
Design/Engineering	1981	33.0	34.5	9.1		
	1983	38.3	40.2	11.0	47	45
Administration	1981	43.0	50.0	34.1		
	1983	47.5	56.0	37.8	54	32

- Few society members move directly into administration soon after the completion of their PhD Mid-career shifts into administration, however, are typical and extremely profitable, with median salaries as much as $22,000 higher than colleagues in other work activities.

- While similar in age, PhDs working in teaching and administration find themselves at the opposite ends of the work-activity salary scale, with a disparity in absolute salary of nearly $27,000 in 1983.

- Caution should be taken when interpreting salary data for lower degree holders. The relatively small number of nonstudent Masters and Bachelors who belong to AIP Member Societies may not be representative of all lower degree holders with physics or related science and engineering backgrounds.

- Masters remaining in teaching or in administration were the oldest and had the lowest percentage salary increases, while individuals in design, engineering and development were younger and received relatively large increases. All of the increases observed for Masters were larger than the inflation rate for that period.

Table 26. 1983 salaries by sex for selected employer types.

	Quartile Salaries			Mean	Standard	Difference in Means		Median	Total
	25th	Median	75th	Salary	Deviation	Observed %	Adjusted %	Age	Number Known
Universities (9-10) and Colleges - Professors & Associate Professors (PhDs)									
Male	29.7	35.0	42.2	36.3	9.3	11	3	48	793
Female	26.5	32.9	37.6	32.8	6.8			44	27
Universities (9-10) and Colleges - Junior Academic Ranks (PhDs)									
Male	20.8	24.0	27.0	24.3	5.2	12	9	35	146
Female	19.0	21.0	22.8	21.7	5.1			37	19
Universities (11-12) - Junior Academic Ranks (PhDs)									
Male	25.2	31.4	36.5	32.5	10.9	15	20	36	128
Female	23.0	27.1	32.2	28.1	8.0			40	17
Secondary Schools (All Degrees)									
Male	22.0	25.0	30.0	26.2	6.3	11	10	44	165
Female	18.0	25.5	29.4	23.5	6.0			47	23
Industry (All Degrees)									
Male	38.8	46.0	55.4	48.8	16.5	28	7	42	1539
Female	30.4	37.5	43.1	38.2	11.1			33	58
Government, National Laboratories & Non-Profit Organizations (PhDs, Masters)									
Male	38.4	45.0	53.0	46.3	11.2	14	8	44	974
Female	32.0	40.7	45.9	40.7	10.8			41	58

SALARIES FOR MEN AND WOMEN

- Only a small percentage of society members are women, less than 5% of the PhDs and 6–8% of the Bachelors and Masters.

- In comparison to men, women are more likely to work for secondary schools and non-profit organizations and less likely to be employed by industry and the national laboratories.

- Women who hold senior faculty positions and those who are employed in industry and in other nonacademic settings tend to be younger than their male colleagues. This age pattern is reversed in secondary schools and among junior academic ranks at universities and colleges, where women are older than their male colleagues. This is a function of both the recent shifts in the employment patterns of women away from academe and toward industry, and the longer time that women spend in the untenured ranks.

Table 27. 1983 industrial salaries by sex and years from degree.

	Median Salary (in thousands of dollars)	Mean Salary	Standard Deviation	Median Age	Total Number Known
YEARS FROM DEGREE					
0-4					
Male	37.0	36.7	7.7	31	247
Female	34.4	34.2	8.0	30	22
5-9					
Male	42.0	42.5	10.7	35	341
Female	36.0	36.8	8.7	33	26
10+					
Male	50.7	53.6	17.8	48	986
Female	43.5	43.5	15.1	46	15

Table 28. 1981 and 1983 salaries by sex and major employment sector.

	Salary Year		Median Salary (in thousands of dollars)	Mean Salary	Standard Deviation	Median Age	Total Number Known
ACADEMIC	1981	Male	30.0	31.6	10.3		
		Female	24.0	25.5	8.1		
	1983	Male	34.0	36.2	11.4	46	1298
		Female	28.5	30.0	10.7	45	77
NONACADEMIC	1981	Male	40.0	42.1	13.9		
		Female	34.5	35.2	8.5		
	1983	Male	47.0	49.1	14.4	44	1634
		Female	41.9	42.5	10.2	38	69

- The salaries of women society members are lower on average than those of men. This partly reflects different employer distributions, but it is rooted in the lower salary levels for women within each of six major employment situations.

- Salary-level differences between men and women range from 11 to 28%. In industry, where the observed difference is greatest, it is largely an effect of differences in age. When age and degree level are statistically controlled,[3] the salary differential in industry drops to 7%.

- Controlling for age and degree level in the other employment sectors, one finds the closest approximation to salary equity among men and women senior faculty and the greatest departure from equity among those in junior academic ranks working at universities on 11–12-month contracts. In fact, this latter group is the only one for which the age structure initially masked the magnitude of the salary inequity.

[3]The adjustment procedure is described in the technical notes.

APPENDIX A: GEOGRAPHIC DIVISIONS

NEW ENGLAND
Connnecticut
Maine
Massachusetts
New Hampshire
Rhode Island
Vermont

MIDDLE ATLANTIC
New Jersey
New York
Pennsylvania

SOUTH ATLANTIC
Delaware
District of Columbia
Florida
Georgia
Maryland
North Carolina
South Carolina
Virginia
West Virginia
Puerto Rico

EAST NORTH CENTRAL
Illinois
Indiana
Michigan
Ohio
Wisconsin

EAST SOUTH CENTRAL
Alabama
Kentucky
Mississippi
Tennessee

WEST NORTH CENTRAL
Iowa
Kansas
Minnesota
Missouri
Nebraska
North Dakota
South Dakota

WEST SOUTH CENTRAL
Arkansas
Louisiana
Oklahoma
Texas

MOUNTAIN
Arizona
Colorado
Idaho
Montana
Nevada
New Mexico
Utah
Wyoming

PACIFIC
Alaska
Hawaii
Oregon
Washington
California

APPENDIX B: TECHNICAL NOTES

Median

The median, a measure that is frequently used in this report, is that point in a distribution above and below which 50% of the values fall. Since it is less influenced by extreme values than the arithmatic mean, it is the preferred descriptive measure of central tendency in typically skewed salary and age distributions. In most of the tables, both median and mean salaries are presented; observed differences reflect the skewness in the distributions.

Quantile Calculations

The SAS and P-STAT statistical packages were used to compute the medians and other quantiles presented in the salary tables and figures. It should be noted that these packages work with an ordered distribution of value points. In such an ordered distribution, the median, for example, equals the central point in an odd-numbered distribution and a weighted value between the two middle points in an even-numbered distribution.

Quantiles and Interquantile Ranges

Ninety percent of the values in a distribution fall below the ninth decile, seventy-five percent below the third quartile, twenty-five percent below the first quartile and ten percent below the first decile. The inter-decile and interquartile ranges, which indicate diffferences between deciles and between quartiles, are measures of variation within distributions and are used in several of this report's salary figures.

Employment Base

Salary data are presented for current society members who are employed full-time in the U.S. Some separate but limited information on Canadian residents is also provided. Students are not included.

Sampling Error

The salary figures in this report may be affected by different sources of error. Society members who did not respond may have had somewhat different salaries than those who did respond, thus introducing response bias. Although earlier surveys in this series estimated that the effects of response bias were minor, the possible effect remains. A fuller explanation of response bias is presented in the methodological appendices of the membership profiles.

Since the data in this report are based upon a small random sample, they are also subject to sampling error. The variability introduced by the sampling procedure depends both on the size of the sub-group being examined, and the variation of values in the population. the formulas below present conservative estimates of the standard error based on simple random sampling. When standard errors were calculated, taking into account the minor stratification by society used in the sampling, slightly lower estimates resulted. Confidence intervals for proportions, means and medians can be determined as follows:

Means:

$\bar{x} \pm Zs/(n)^{1/2}$, where

$\bar{x}$ = the arithmetic mean,
s = standard deviation,
n = sample size, and
Z = coefficient of confidence, 1.96 at the 95% confidence level.

Proportions:

$$p \pm Z\left(\frac{p(1-p)}{n}\right)^{1/2}$$

p = sample proportion observed.
n = sample size, and
Z = coefficient of confidence, 1.96 at the 95% confidence level.

Medians:

M_1, that point below which p_1^{th} values fall,
M_2, that point below which p_2^{th} values fall,

where

$$p_1 = p + Z\left(\frac{p(1-p)}{n}\right)^{1/2}, \quad p_2 = p - Z\left(\frac{p(1-p)}{n}\right)^{1/2},$$

and

$p = 0.5$,
n = sample size,
Z = coefficient of confidence, 1.96 at the 95% confidence level.

Standardization

In two analytic sections of this report standardization techniques were used to control on related variables that effect salary levels. To examine directly the impact of regional variation on salaries, variation in employer type was controlled. Employer-adjusted average salaries for each region were calculated by applying the nationwide employer distribution to the employer-specific mean salaries within each region. Similarly, to examine the effect of sex on salaries, both age and level of highest degree were controlled. The age and degree distributions of female society members were applied to the age and degree specific mean male salaries. The resultant adjusted salaries were then analyzed for remaining sex-related differences.

Cost of Living Index

The cost of living index used in this report was developed by the American Chamber of Commerce Researchers' Association (ACCRA). Its purpose is to provide "a useful and reasonably accurate measurement of inter-city cost of living differences." The index measures "relative price levels for consumer goods and services in participating cities, as compared with the national average for all participating cities (metropolitan and nonmetropolitan)." Differences of more than three index whole numbers in the All-Items index can be considered to represent actual inter-city differences in the costs of consumer goods and services; but the percentage difference in such cases should be considered a reasonable indication, rather than a precise measure, of the extent of the differences.